The BRICS and Africa's search for green growth, clean energy and sustainable development

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Abstract

The BRICS group of countries is widely held to offer the prospect of a new approach to sustainable development, renewable energy and green economic growth in Africa. This paper examines the BRICS' approach to renewable energy cooperation. It argues that, following a robust declaratory intent, implementation has taken time to achieve but there are signs of this coming on-stream. The New Development Bank can provide an effective intervention mechanism for the BRICS in Africa. New BRICS' policy initiatives suggest a more accelerated approach on renewable energy investment and technological cooperation. However, for the foreseeable future, individual members will be the drivers of the transfer process, particularly China and India. In terms of policy, the BRICS need to elaborate a specific strategy for renewable energy cooperation for both intra-BRICS and extra-BRICS development. Policies should also prioritise their pro-poor rationale and intent to widen energy access, achieve energy equity and overcome energy poverty. China and India, have a significant existing and growing capacity to help move this forward.

Keywords:

BRICS; renewable energy; green economy; Africa; sustainable development

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1. Introduction

The BRICS economies (Brazil, Russia, India, China and South Africa) generated almost 23 percent of the world's GDP in 2015 and contributed over half of global economic growth since the group began its dialogue in 2006 (BRICS, 2017*)*. Given this growing importance, this paper addresses the question 'How are the BRICS countries contributing to Sub-Saharan Africa's aims to increase its clean energy, extend access to energy, and create 'green' economies through renewable energy?' This article explains and evaluates the role of the BRICS countries in Africa's search for clean energy, sustainable development and green growth and transformation. This study focuses on the contribution of the BRICS as a collective grouping and on its individual members to Africa's sustainable development through renewable energy technology transfers. It explains and evaluates the BRICS approach to sustainable development, the work the group is developing on renewable energy technology and transfer cooperation inside the BRICS and, at the level of the individual members, outside the BRICS to the economies often referred to as the 'Global South'.

The aim of the paper is to contribute to the energy policy literature by providing a closer understanding of the role and impact of the BRICS group of emerging economies in the renewable energies (RE) sector and green transformations in Africa. The paper examines the contribution of BRICS to energy as "an enabler to achieve the Sustainable Development Goals and Agenda 2063 in Africa" (AMCEN, 2017), considering central policy interests of financing; technology; knowledge transfers; and capacity-building. One component of this enabling process is 'green growth', "the promotion and maximization of opportunities from economic growth through building resilience, managing natural assets efficiently and sustainably, including enhancing agricultural productivity, and promoting sustainable infrastructure" (AfDB, 2016). However, the context for fully realising the potential contribution of the BRICS to Sub-Saharan African green transformation and sustainable development is complex and multifaceted, involving significant issues about access to energy, energy poverty and equity, the linkage of energy and particularly REs, to inclusive green growth and development, and implications for pro-poor strategies, strengthened human security in terms of health and food.

In order to examine these issues and answer the central research question, the paper applies a Human Security analytical perspective, detailed in Section 3. However, by way of introduction, Human Security focuses upon the ways that economic, socio-cultural and political barriers operate as mutually-constitutive factors limiting development and realisation of individual human potential and upon the emancipatory interventions necessary to overcome these by increasing 'capabilities freedom'.

The present study argues that achieving green growth and green transformation requires a holistic approach. The BRICS can help contribute to this aim. The BRICS group is seeking to turn declaratory intent into action to maximise the potential of collaboration between members and beyond to Africa. The BRICS countries have been in dialogue since 2011 to establish institutionalised working groups and tangible goals that will further develop the internal collaboration on renewable or clean energies and form a longer-term basis for wider, external South-South cooperation (BRICS, 2012). Individual BRICS members, most notably China and India, are investing heavily in RE technology and its application.

This paper is structured around five sections. Section 1 is this Introduction. This has set out the parameters of the study, identifying the central research problematic. Section 2 examines the context of this study. This includes a short review of the literature on BRICS and Africa, background on the Intergovernmental Panel on Climate Change, and the emerging notion of South-South cooperation. Section 3 details the Human Security analytical approach. Section 4 explains and assesses the BRICS' evolving approach to climate change and renewable energy technology cooperation. This part of the discussion considers the group's collective response and that of China and India as case studies. Section 5 draws conclusions and identifies policy recommendations.

2. Literature Review and Background

2.1 Literature

Reflecting the increasing economic and political significance of the BRICS, there is an extensive and growing literature on the BRICS group itself as well as the group's development assistance role and its relations with Africa. The arrival of BRICS as a substantive and substantial element in the global economic and political systems has attracted widespread interest and assessment, with one early commentator arguing that there was a "silent revolution in development assistance" (Woods, 2008). Initial analysis focused on the formation and evolving development of the BRICS group itself. A useful review of the literature up to 2013 is that of Younis *et.al.* (2013). As the group demonstrated increasing solidity and durability, a growing literature has focused upon the implications of the emerging powers for the international development community and traditional development assistance system (Gu *et.al.*, 2016; Chenoy and Joshi, 2016; Carey and Li, 2014; de Renzio and Seifert, 2014); Watson, 2014; Rodrik, 2013; Mawdsley, 2012; Stephen, 2012; Chandy and Kharas, 2011). An important strand of thought emerging in this literature is the idea of 'challenge' or 'convergence' and 'divergence'; evaluating the extent to which the BRICS offer a distinctive approach to international development assistance and differ in their aims, interests, practices and attitude to the traditional system, its foundational principles and the workings of its central institutions (Gu *et.al.*, 2016; Browne and Weiss, 2014; Carey and Li, 2013; Rowlands, 2012; Weinlich, 2014). Consideration of the BRICS' difference in approach has also included evaluation of the role of South-South Cooperation (Risen, 2015; Stuenkel, 2013; Quadir, 2013), the post-2015 sustainable agenda and Sustainable Development Goals (SDGs) (Constantine and Pontual, 2015; Hackenesch and Janus, 2014), and its contribution to the Global Partnership for Effective Development Cooperation (Constantine *et.al.*, 2015). A further central strand of analysis of the BRICS focuses on the group's emerging role and impact in financing development and the new multilateral development banks, (Dixon, 2015; Prado and Salles, 2014; Qobo and Soko, 2015; Griffith-Jones, 2014; Chin, 2014; Schablitzki, 2014; Watson *et.al.*, 2013), the G20 (Wang, 2016; Callaghan and Hubbard, 2016; Humphrey, *et.al.*, 2015; Reisen, 2015; Kauai, 2015; Chin and Quadir 2012; Chin 2012; Kharas, 2010; Chahoud, 2008). Beyond the initial focus on the BRICS as a solidifying grouping in international relations, there is increasing attention to the significance for the group's evolving profile and development of the differences between the economic and political trajectories of the respective members (Gu, *et.al.*, 2016). This perspective on the BRICS includes the literature on the individual member economies, for example, Brazil (Alden, 2017c; Vaz and Inoue, 2007), India and Africa (Mawdsley and McCann, 2011) and Brazil and China (Niu, 2014), and the role of CSOs and think tanks in transforming the contributions of "rising powers" to sustainable development (Shankland and Constantine, 2014).

Overlapping this extensive literature on the BRICS is a burgeoning body of analytical writing specifically on China and African development (Bräutigam, 2010; Alden *et.al*., 2017*a)*; Chinese aid and African development "Exporting Green Revolution" (Bräutigam, 1998); the distinctive character of Chinese 'foreign aid' (Bräutigam, 2010); the factors driving Chinese firms "going out" to Africa and their corporate experiences (Gu, 2009; 2011); "industrial capacity cooperation" (Abdenur, 2014); China and the 2030 Agenda (King, 2014); triangular cooperation (Gu, 2017); China's role in environmental innovation (Urban, 2015) and low carbon transitions in developing economies (Urban, 2014); China's regional forum diplomacy (Alden and Alves, 2017*);* and specific country studies such as South Africa's foreign relations with China (Alden and Wu, 2016).

2.2 Background

BRICS has actively championed the need to include developing countries centrally within the global economy, providing multilateral infrastructural finance through its New Development Bank. In addition, all members provide international development assistance centred on financial and technical assistance; with China, India and Brazil increasingly prominent as development partners for African economies (Lesley and Chijioke, 2013). As the BRICS group has increased in economic and political importance, expectations have also risen that the group can make a decisive difference to African states aspiring to develop green economies, especially through renewable energy technology transfers and cooperation (Lesley and Chijioke, 2013).

'Green transformation' has been defined as aiming at "creating an inclusive prosperity while maintaining the sustainability of natural ecosystems, connecting green transformation requirements to national economic development, bringing about a fundamental shift in the way people live, and promoting collective social ideas" (CCICED, 2015). Renewable energy is defined as including bioenergy, direct solar energy, geo-thermal energy, hydropower, ocean energy, and wind energy (IPCC, 2011). The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) ―AR5—identified Africa is the most vulnerable and exposed region in the world to the adverse impact of climate change, but has the least capacity to effectively combat the sheer enormity of the challenge (IPCC, 2014*a*; 2014*b*: 1204).

The present study relates this emerging strand of South-South Cooperation to Africa's strategic aspiration of creating national and regional green economies. As the Economic Commission for Africa has argued, "Green technologies offer Africa a chance to "leapfrog" from carbon-intensive development characterised by wasteful and unsustainable technologies and systems as used by developed countries, by directly transitioning to cleaner and renewable energy sources needed to achieve sustainable development" (ECA, 2014: 12). This study adopts the definition of a green economy as "one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP, 2013). Africa's own statement of intent, embodied in its emotive vision and roadmap *Africa 2063: The Africa We Want* , specifies the continent's desire to grow African green economies (UN, 2015). However, reservations remain with regard to the full realisation of the potential contribution of renewable energies. For example, adverse deployment conditions can impact adversely upon realisation of the technical potential of individual sources of energy (Bruckner *et.al.*, 2014: 526).

The first meeting of the BRICS environment ministers, held in Moscow in April 2015, agreed that sustainable development should address: poverty eradication; changing unsustainable and promoting sustainable patterns of consumption and production (SCP); protecting and managing the natural

resource base of economic and social development; and addressing climate change (Lebada, 2015). In respect to the elaboration of a broad range of sustainable development narratives, the BRICS stress the importance of adopting a holistic approach to development and climate change, mitigation responses forming part of a complex whole centred upon economic restructuring, a mixture of energy sources to reduce fossil fuel reliance and increase the contribution of renewable sources; recognition of the inter-connected and mutually-constitutive relationships between multiple policy domains and strategic goals, whilst advocating the principle of "Common But Differentiated Responsibilities" argued to help account for differing national circumstances and respecting national policies and priorities.

In realising fully the potential contribution of the BRICS to Sub-Saharan African green transformation and sustainable development is complex and multifaceted, involving significant issues about access to energy, energy poverty and equity, the linkage of energy and particularly REs, to inclusive green growth, transformation, and development, and implications for pro-poor strategies. As Stieglitz argued over a decade ago, "Development is about transforming the lives of people, not just transforming economies" (2006). 'Development' is a normative, emancipatory and avowedly empowering project; policies and practices focused on improving the daily lives and life-chances of people. The linkage between a widened access to energy and improved human development forms a key facet of this emancipatory and empowerment process, a point acknowledged in UNDP studies published over a decade ago (Gayle, 2007). The specific importance of renewable energies for sustainable and equitable development have also long been recognised (UNDP, 1991: 29; Mira *et.al*., 2006). This linkage is central to the 2030 Sustainable Development and 2063 Agendas. As a UNECA study has indicated, however, the challenge is being able to ensure that implementation of the policy goals and targets of the SDGs and Africa 2063 are effectively synchronised. The study notes the important role that the African Common Position (ACP) played in formulation of the SDGs and Agenda 2063 (Armah, u.d.). In response to these arguments and as RE technology has continued to advance, there has been a significant policy focus on the linkages between energy, REs and green growth and transformation in Africa. For example, UNECA has argued strongly in favour of inclusive green growth as a strategy for African sustainable development (UNECA, 2015*a)*, the fifth Sustainable Development Report on Africa stating that:

> "Inclusive green growth policies and practices can contribute to meeting the challenges of energy insecurity and poverty; reducing energy intensity; enhancing the clean energy mix; increasing energy access and consumption; reducing energy prices; and reducing environmental impacts, while improving human welfare." "Further development of the renewable energy sector presents considerable opportunities for inclusive green growth. … Renewable energy can create up to 25 per cent more jobs than coal and 90 per cent more jobs than nuclear energy, per unit of energy generated" (UNECA, 2015*b* : 6-7).

However, significant challenges remain in developing Sub-Saharan Africa's RE sector and to realising the potential of REs to African green transformation and green growth: a low RE sectoral investment, the high cost of RE technologies, and small markets for products (UNECA, 2015: 7). Here the BRICS and its individual members can offer a practical policy option for Sub-Saharan African governments as they address the key human security challenges of climate change, poverty reduction, sustainable development, energy equity. BRICS can bring investment, technology, knowledge and skills transfers.

Access and connection to electric power with its potential to transform lives is fundamentally important to empowering people to overcome the unfreedoms that they face daily and increasing their human security by providing new, cleaner, and more efficient cooking, heating, lighting and communications (Karlsson-Vinkhuyzen and Jollands, 2013). The challenge of human security in Sub-Saharan Africa with respect to electricity is stark. Sub-Saharan Africa has the world's most limited access to electricity. With 13 percent of the world's population, it accounts for only 48 percent — approximately 600 million people — of the share of the global population without access to electricity. Sub-Saharan Africa's electricity consumption rate is also also dramatically low with average electricity consumption in the region (excluding South Africa) only about 150 kilowatt-hours per capita; a fraction of consumption rates in Brazil, India, and South Africa. Africa's population is expected to increase to 1.6 billion people by 2030. "if current energy access trends continue, in 2030 there will still be 655 million people in Africa (42% of the population) without access to power, and 866 million (56% of the population) without clean cooking facilities, depriving the majority of the population of the opportunity to pursue a healthy and productive life" (IRENA, 2013: 5) and sustained economic growth is needed to enable this to be achieved. According to the IRENA report, Africa's GDP should increase three-fold by 2030 and seven-fold by 2050. If "growth is good for the poor" (Kraay and Dollar, 2001) and access to energy has the potential to contribute to inclusive sustainable growth and development and greater human security, then major investment in the energy sector is critical to prevent an energy shortfall. To drive this growth, energy providing full electricity access to all Africans would require an additional 900 TWh over 20 years. This, in turn, will require significant investment in the energy sector. One estimate is that this will be between US$60 billion and US$90 billion annually to address its energy shortfall, roughly quadruple 2014 investment levels (AMCEN, 2017: 2). A McKinsey analysis concluded that, by 2040, Sub-Saharan Africa's electricity demand would quadruple over its 2010 usage and, assuming each economy "builds what it needs" to meet this demand, this will require approximately US$490 billion of capital for new generating capacity and an additional US$345 billion for transmission and distribution. The study finds that, if the region adopts a robust approach to promoting REs, these can play a significant role in capacity-building with a 35 percent higher installed capacity base and reducing CO2 emissions by 27 percent. But this would require an extra 31 percent higher capital spending — around US$153 billion (Castellano, *et.al.*, 2015: 2-5).

3. Analytical Perspective

A decade ago, Kofi Annan argued that "Human Security in its broadest sense embraces far more than the absence of violent conflict. It embraces human rights, good governance, access to education and and health care and ensuring that each individual has opportunities and choices to fulfill his or her own potential' (2005). As an analytical approach, Human Security reflects the influences of Amartya Sen (1999). It centres upon the overcoming of economic, social, political and cultural obstacles to the realisation of human potential and aspiration. In so doing, it has a framework comprised of vertical and horizontal components. Vertically, it moves beyond a singular concern with the state per se to have multiple levels of analysis above at the supra-state level, and below the state to societal and individual levels of experience. Horizontally, it specifies a range of categories of factors constraining human capabilities, or tabulated indices as in the UNDP's Human Development Index.

Following Sen, these are located within a range of mutually-constitutive domains: economic, political, social and cultural. The analytical approach is emancipatory in thrust. Sen's central premise is that, in many developing countries, people's aspirations and life-chances are obstructed by a range

of mutually constitutive economic, social, cultural and political barriers that undermine the development of individual capabilities. These 'unfreedoms' can be countered and overcome by identifying the way these barriers operate, initiating and implementing measures across the domains to facilitate empowerment and emancipation and thereby promote 'capabilities freedom' and strengthen human security. This focus and analytical frame makes it a particularly appropriate instrument with which to investigate and evaluate the present study, correlating a complexity of domestic and international levels and domains. Reflecting the multidimensional and interconnected character of energy, green transformation and sustainable development, the holistic approach provided by Human Security helps us to focus upon the multiple global, national, societal and individual levels of development challenges in an integrated framework.

4. The BRICS and Renewable Energy Cooperation

Climate change is a major challenge for all economies, but especially for developing and emerging economies that have greater vulnerability and risk exposure (Renwick, 2017, 2016). This particularly the case for the BRICS economies. They have been galvanised into remedial action by the harsh reality of their existing heavy dependencies upon fossil fuels. This reliance on coal and oil, in turn, underpinned their status as the source of much of the world's carbon dioxide (CO2) emissions. In 2016, China, India and Russia contributing almost 40 percent of global emissions (Statista, 2017). The cost to human security in these economies is high in terms of health, lost incomes, working days, and productivity as well as the costs of climate-related natural disasters. For example, extreme weather events are costing India US$9-10 billion annually with food insecurity intensifying. By 2030, India may need 70 million tonnes more of foodgrains than the production in 2016-17 as demand is predicted to have risen by 30 percent by 2030 over 2011 (Times of India, 2017).

Responding to this, the BRICS realise that "energy based on fossil fuels will continue to dominate the energy mix for the foreseeable future." However, they have agreed to increase their sourcing of clean and renewable energy, the use of energy efficient and alternative technologies and respond to climate change. The group also gave an explicit commitment on RE cooperation, agreeing "to exchange knowledge, know-how, technology and best practices in these areas" (BRICS, 2012). With respect to green growth, the BRICS policy position is that the concept of a green economy "has to be understood in the larger framework of sustainable development and poverty eradication and is a means to achieve these fundamental and overriding priorities, not an end in itself" and countries should be allowed to define their paths towards sustainable development (BRICS, 2015).

Table 1 identifies the key meetings and the corresponding discussions and decisions that were made to move forward on practical measures related to the green economy in Africa. The creation of the New Development Bank in July 2015 and subsequent establishment in August 2017 of its Africa Regional Centre in South Africa reinforced the capacity-building, technical and infrastructure focus of the BRICS approach to sustainable development, climate change and green economy growth. With this distinctive funding template, the Bank expects that some 60 percent of its funding will be directed at renewable projects (NDB, 2016). In its initial year of operations, the Bank provided US $1.5 billion, approximately 75 percent of this this going to funding solar, wind and hydroelectric RE projects in the BRICS states. Within this portfolio, funding worth US$180 million was approved to South Africa's ESKOM as a sovereign guaranteed project. The funding, to be provided over a maximum of 20 years, is for infrastructure capacity-building for RE transmission, "intended to provide a substantial development impact in generating 670 MW RE evacuated (transmitted) and avoiding

1,300,000 t CO2/year" (NDB, 2017). The initiative has the potential to contribute substantially to strengthening human security as the funds from the loan will mostly be used to widen access to energy by connecting households in areas where there is no electricity. Part of the loan will be used to ensure that 44 companies are connected to the grid as part of the Renewable Energy Independent Power Producer Programme with sufficient transmission lines. The NDB's new General Strategy 2017-2021 has committed it to a gradual widening of its membership, based on principles of geographic diversity and a "reasonable mix" of advanced, middle-income and lower-income countries. Significantly, the Strategy is to concentrate funding on "sustainable infrastructure" projects and one of the designated "key areas of operation" is clean energy:

> (i) structural transformation of the energy sector, in particular by promoting emerging renewable technologies; (ii) energy efficiency, including the upgrade of existing power plants, overhaul of electricity grids and energy-efficient building techniques; and (iii) reduction of air, water and soil pollution in the energy sector. Specific projects could include: offshore wind energy, distributed solar energy generation, hydro-power plants and smart urban energy systems. NDB emphasizes in its operations the adoption of innovative new technologies, such as energy storage systems, adaptable smart electricity grids and solid-waste-based energy generation (NDB, 2017: 20).

Table 1 –BRICS Meetings and Agreed Outcomes 2011-2015

Meeting	Agreed Outcomes
2012 BRICS Summit (New Delhi, India)	Multilateral energy cooperation within BRICS framework was a designated "New Area of Cooperation".
	Leaders stated that "energy based on fossil fuels will continue to dominate the energy mix for the foreseeable future." However, continued to pledge to increase their sourcing of clean and renewable energy, the use of energy efficient and alternative technologies and respond to climate change.
	Explicit commitment to RE technology cooperation: "Given our growing needs for renewable energy resources as well as on energy efficient and environmentally friendly technologies, and our complementary strengths in these areas, we agree to exchange knowledge, know-how, technology and best practices in these areas."
BRICS' 2013 Durban Summit (Durban, March 2013)	The BRICS Multilateral Infrastructure Co-Financing Agreement for Africa was designed to promote co-financing arrangements for infrastructure projects across the continent.
	BRICS Multilateral Cooperation and Co-Financing Agreement for Sustainable Development was created with the intention of focussing on bilateral, rather than multilateral, cooperation and co-financing agreements for green economic growth and development.
2015 UfA Summit (Russia, April 2015)	Established a working group on environment to identify priority areas of co-operation.
	Explored the potential of the BRICS' NDB to fund environmental projects.

	Explored the possibility of establishing a collaborative platform of the BRICS countries to share best environmental practices and facilitate the exchange of environmentally sound technologies and know-how with participation of public and private stakeholders.
	Identified the need to establish a public-private partnership mechanism to increase green investments.
Xiamen BRICS Summit (Xiamen, September 2017)	Recognised the strategic importance of energy to economic development and the importance of clean and renewable energy and that it needs to be "affordable to all".
	Commitment to cooperate to "foster open, flexible and transparent markets for energy commodities and technologies.
	Agreed to promote the most effective use of fossil fuels and wider use of gas, hydro and nuclear power, arguing that this will "contribute to the transformation toward a low emissions economy, better energy access, and sustainable development."
	Commitment to "further promote green development and low-carbon economy, in the context of sustainable development and poverty eradication, enhance BRICS cooperation on climate change and expand green financing".

There have been long-standing bilateral cooperative moves between some of the BRICS members over the years, such as the China-Brazil Centre for Climate Change and Energy Technology Innovation established at Tsinghua University in partnership with the Federal University of Rio de Janeiro and funded by a Brazilian science and technology funding agency (Cuperstein, 2014) and there is also Brazil-China Wind Energy Technology Cooperation including institutional, public and private research and development collaboration. However, a study of Sino-Brazilian wind energy cooperation has shown that there have been difficulties that have restricted the degree and effectiveness of the relationship including different trajectories in their respective government policies, with China adopting a more market-centred approach to renewables and their agreed wind energy joint venture not proceeding (Bae and Zoraida, 2014). Much of the current discussion on energy cooperation is framed in the context of the "Belt and Road" Initiative, the trade, investment and development process originally conceived and promoted by China (Gu, McCluskey and Mushi, 2015).

However, BRICS countries are, of course, also competitors in the RE sector. For example, in the solar sector, the second Russian renewable energy project auction held May-June 2014 granted the majority of the state-supported solar capacity to China-based Amur Sirius. The Chinese firm won 175 MW of the offered 496 MW of solar for the years of 2015, 2016, 2017 and 2018, while Russian state-owned enterprises gained smaller shares. The auction winners secured rights to manage selected projects for 15 years with an anticipated return on investment of no less than 14 per cent. To bolster Russian RE, Russian law has local content rules, setting targets of 55 percent Russia-made content by 2015 and 70 percent starting in 2016 for new solar projects and 55 percent and 65 percent for wind power projects (Jegelevicius, 2014a; 2014b; 2013). However, some commentators argue that Chinese firms such as Amur Sirius have circumvented the local content rules by setting up a Russian subsidiary, Solar Systems and through Chinese financial power, funding solar power projects through a Russian affiliate of the China Construction Bank (Jegelevicius, 2014*a*).

In moving to assess the potential for actually realising these stated BRICS' aims and objectives there are substantial limiting factors that need to be factored in beyond the political discourse. These factors included an absence of a viable state and private sector infrastructure to support the successful development of RE technologies, the poor quality of the technology being produced, limited RE investment, and institutional and regulatory constraints (Huifeng, 2015). In addition, whilst the BRICS are often referred to as a consolidated and almost homogenised group where synergies are emphasised, this is far from the case. As a recent study has illustrated, a deeper understanding and evaluation of the functioning and impact comes from incorporating an examination of the disaggregated and heterogeneous character of this grouping operating at the sub-BRICS level (Gu *et.al.,* 2016). Clearly, domestic economic trajectories play a significant role. Here, for example, Brazil's climate change mitigation management and commitment has been criticised by organisations as weakening in recent years against a backdrop of economic slowdown and political instability (Union of Concerned Scientists, 2017). These factors also centre upon the question of what BRICS can contribute in terms of RE funding for Sub-Saharan Africa? For the present and immediate future, BRICS member financial investment contributions to Africa's energy requirements by Russia will be limited outside of the nuclear power sector, reducing in the case of Brazil, and also limited by South Africa. Russia's energy sector is heavily embedded in biomass fuels, reflecting its own natural resource base. Renewables play a very small part, representing only 3.6 per cent of total energy consumption. In October 2016, President Putin stated at the UN that Russia intends to produce more RE (Reilly, 2017). Under the state's programme, "Energy Efficiency and Energy Development in Russia during 2013-2020", the Federation's current planning policy for Renewable Energy Source Development Measures (RESDM) is for REs to contribute 5 percent of total final energy consumption by 2030. To help drive this, a subsidy programme for REs was approved in 2012 An International Renewable Energy Agency analysis concluded that "Accelerated deployment, however, could boost Russia's renewable energy share to more than 11% in the same timeframe" (IRENA, 2017: 1). Even if Russia's development co-operation is factored-in, the African auspices are poor given that the vast majority of Russia's assistance goes to the Commonwealth of Independent States (CIS), although indirect transfers to Africa may be said to eventuate indirectly through its multilateral ODA contributions, currently 22 percent of its total ODA (OECD, u.d.). Russia's energy corporations have demonstrated a recent taste for the African nuclear power market and, in the longer-term, as Russia's RE sector emerges a future substantive RE contribution under the BRICS umbrella might eventuate as it seeks to fulfil its policy commitments. But, for the present at least, this is not a viable prospect. There has been some degree of commentary that Russia is "returning" to Africa and particularly to its energy sector, spurred by recent agreements on nuclear power struck with South Africa and Egypt and the strength and warmth of President Putin's comments about Africa at the Durban BRICS summit. In terms of solar, wind, wave and hydro REs, this is improbable scenario in the short-to-medium term. For Brazil, its ability to contribute to Africa's energy capacity-building, green growth and transformation has been hit hard by domestic economic and political turbulence since the end of the Administrations of Inácio 'Lula' da Silva, the removal from office of his successor, Dilma Rousseff. The conservative government marginalised the SSC and the technical cooperation budget has been cut drastically (OECD, u.d.). A budget spending cap passed into law in 2016. This freezes government spending for 20 years. South Africa provides bilateral development co-operation in the form of technical co-operation (OECD, u.d.). South Africa has made a major commitment to RE development, mobilising significant investment mechanisms to support its RE strategy. South Africa is both a recipient of energy and RE investment. With well-developed energy investment climate provisions such as the Independent Power Producer Procurement Programme (IPPPP), national and international public and private investment has flowed in. South Africa is also a provider of development assistance. South Africa's total

concessional finance for development reached US4,100 million in 2015, compared to US4 148 million in 2014. In addition, the country is also actively engaged in the promotion of energy cooperation and RE across Sub-Saharan Africa and the wider continent, synchronising policy and practical initiatives such as the Southern African Power Pool (IRENA, 2013). However, its capacity to contribute substantial investment in REs across Africa is, at yet, limited until a critical mass is achieved within its own sector. This leaves China and India as the principal BRICS' member state investors. These are examined in more detail in the following sections 4.1 and 4.2.

4.1 China

In Sub-Saharan Africa, China provided approximately US$13 billion for power sector development in the period 2010-2015, around 20 percent of all investments in the sector in the region, the funding being comprised of a mixture of loans, buyer/seller credits and foreign direct investment (FDI) (OECD/IEA, 2016: 8).

China's understanding of sustainable development emphasises the need for a holistic, integrated approach to policy and practice (Zhang, Gu and Chen, 2014). This approach is embedded in China's own domestic processes of economic reform and restructuring, rebalancing of its energy sourcing and climate change mitigation. In 2008, an important analysis by the China Council for International Cooperation on Environment and Development (CCICED) stated that "China is faced with an extremely grave situation in its sustainable development" and required four major transformations to sustain its economic development and become an environmentally-friendly society: growth should be transformed from mostly investment and export driven to more consumption and domestic demands driven; manufacturing should have a reduced share of the industrial structure with greater weight given to services and agriculture; the basis for development should be shifted from capitals and natural resources to human resources and technical progress; and the uni-directional linear process of resources- products- waste should be replaced by the feedback cyclic process of resources- products- waste- resource recycling. The response to this should centre upon creating a national innovation system. One component of the innovation system that was proposed has particular relevance to China's current engagement on global sustainable development and the globalised approach to transformation, namely to put in place an open innovation system whereby both China and developed nations can work together in the innovation efforts. In the process, technological innovation is the source, institutional innovation provides the guarantee, social innovation serves as the basis, and promotion of development and application of energy-saving and environment-friendly technologies represents the core (CCICED, 2008: 5).

A key concept informing the process of change and reformulation of China's 'national governance capacity' today is that of 'green transformation':

> Green transformation aims to generate inclusive prosperity while maintaining the natural systems that sustain us. Green transformation is more than a new mode of economic growth; it redefines the relationship between environmental protection, economic growth and social progress. In this new paradigm, economic and social development and environmental protection reinforce each other to realize the visions of economic prosperity, social harmony, clear water and green mountains (CCICED, 2015: 16).

One element in this process of transformation is the development of RE technologies. China is positioning itself to be a world leader in RE investment and RE technologies (OECD/IEA, 2016). This

particularly important as it seeks structural change towards a low carbon economy for sustainable development (Urban, 2014; 2015). China has implemented a national strategic energy plan to reduce fossil fuel reliance, introduce new technologies to make more efficient use of fossil fuels, fund research on energy technology innovation, provide subsidies and other financial incentives for RE technology development and promote investment and encourage a strong private sector involvement.

China's RE involvement has developed across Sub-Saharan Africa. For example, the Africa Renewable Energy Initiative **(**AREI) and the China-Africa Renewable Energy Cooperation and Innovation Alliance have signed a Memorandum of Understanding (MOU) to cooperate in renewable energy generation in Africa to combat climate change and promote sustainable development. Chinese smart grid providers and core RE manufacturers will be providing technological and financial support. A range of pilot projects are being developed, including construction of micro-grids in some African households and villages, in combination with large-scale power construction (Xinhua, 2017). In Tanzania, China's MCC 20 Hainan International holds a 25 percent ownership of the Makambako Wind Farm commissioned in 2014. China has also funded Stage I of Ethiopia's Aysha Wind Farm Project through loans of US$218.6 million and US$171 million from the Export-Import Bank of China. Stage II of the project began in 2012 following a US$340 million agreement with China's GCOC for the construction of the plant. In assessing the significance of Chinese projects such as these, the question arises as to their actual impact, are they making a difference in extending access to energy and in contributing to cleaner energy, greener growth and human security? If we take additional generation capacity using RE sources as a benchmark, then the OECD/IEA estimates that the additional capacity contributed by projects completed or under construction for the period 2010-2020 reaches 67 percent. If planned projects are included addition capacity totals 56 percent (OECD/IEA, 2016: 18). However, in terms of facilitating stronger human security, access and even connectivity may not, in themselves, be enough; connectivity *per se* does not automatically increase household usage, a key factor being the unit cost of energy and energy poverty.

China's involvement remains controversial, with criticisms raised that it's approach is too focused on government-to-government relations, marginalising local communities despite the Chinese and BRICS commitments to 'people-to-people' relations, for example population displacement in the building of new hydroelectric dams and a weak commitment in practice to commitments to knowledge and skills transfers with Chinese rather than local labour employed (OECD/IEA, 2016). However, on the other side of the balance sheet, there are positive contributions to helping Africa to meet the challenges of access to energy and energy equity and increase the potential for strengthened human security. An OECD/IEA 2016 analysis concluded that "a substantial proportion of Chinese power projects in Sub-Saharan Africa are aimed at expanding access to electricity". The study also concludes that in the decade 2010-2020, a total of 120 million people will gain access to electricity through the power grid, enabled by grid development and increasing power generation capacity, of which Chinese contractors are responsible for 30%" China also contributes to rural 'off-grid solutions' with solar energy kits donated in countries like Rwanda and Comoros (OECD/IEA, 2016: 7). In Rwanda, some 2000 villagers gained access to electricity through the solar kits provided by China. In addition, distribution projects undertaken by Chinese firms have supported networks and connections. For example, in Angola, Sinohydro has enabled access to 5000 people by installing lines and substations (OECD/IEA, 2016: 27).

4.2 India

Indian investment in Africa is characterised by large scale investment in oil, gas and mining sectors by public sector enterprises. Given India's lack of natural resources, energy security is the critical pull factor behind the growth of Indian investments in Africa. A total of 597 Indian companies invested in Africa but the top 11 companies account for about 53 percent of the total Indian investment flows to Africa (Paulo, 2017). India has contributed US$200 million to the New PartnershIip for Africa's Development (NEPAD) initiative and is improving technology based know-how through the Pan-African E-Network Project and the TEAM-9 Initiative (Techno-Economic Approach for Africa-India Movement, a credit facility for the promotion of socio-economic development in eight African countries with the help of Indian technology (Dubey and Biswas, 2016).

India's development partnership with Africa includes extensive financial support. For example, Lines Of Credit are provided through India's EXIM Bank. Working through the framework of the India-Africa Forum Summit (IAFS), by 2015 India had offered Lines of Credit worth US$7.4 billion for 137 projects in 41 countries.The largest recipient sector was Power (29 percent), with the sixth-largest recipient sector was rural electrification (6 percent). Knowledge and skills sharing and transfer in the context of South-South Cooperation are essential instruments for enabling stronger human security. For example, at the first IAFS, India announced a grant of US$ 500 million aimed at supporting African capacity building by establishing specialized institutions, extending scholarships and training programmes and implementing the Pan Africa e-Network project. A further grant of US$700 million was announced by Indian Government at the second IAFS (UNECA, 2015). In 2015, the third IAFS was held in Delhi attended by all 54 African countries. During the summit, India offered US$10 billion for development projects in Africa and a grant assistance of US$600 million these investments, including capacity-building support for an extensive increase in hydropower in Africa. (Dubey and Biswas, 2016).

Indian Government policy is committed to expanding and intensifying its relationship with Africa as is the Indian private sector. This includes further cooperation on REs as Africa increases its participation in the India-led solar organisation, International Solar Alliance, underpinned by a US$2 billion line of credit for African solar development from India. The Alliance was formally launched with 62 members attending in New Delhi in March 2018 (Times of India, 2018). Solar Energy is one of the key areas India is actively working on in Africa. Indicative of the human security aspects of such cooperation and particularly the empowerment and emancipatory impact for women, the "Solar Mamas" initiative, which is supported by the government of India, is providing vocational training related to fabrication, repair and maintenance of solar lanterns and household solar lighting to women from Tanzania and few other African countries. Every year 80 African women receive training in India to work on solar panels and circuits. Each woman is responsible for electrifying 50 houses in her community on return (Indian Express, 2016).

Clearly, both China and India both have African cooperation partnerships with RE components. They are simultaneously partners in development cooperation, but also competitors. Their respective national approaches have a shared focus upon increased technical cooperation and capacity-building with African economies within the multilateral context of the BRICS and wider South-South Cooperation. Both demonstrate important roles played by the state in providing the bilateral political-diplomatic frameworks with Africa for inter-regional and bilateral cooperation as well was loans and grants and lines of credit through the respective EXIM banks. , with criticisms raised that it's approach is too focused on government-to-government relations, marginalising local communities despite the Chinese and BRICS commitments to 'people-to-people' relations, for example population displacement in the building of new hydroelectric dams and a weak commitment in practice

to commitments to knowledge and skills transfers with Chinese rather than local labour employed (OECD/IEA, 2016). However, on the other side of the balance sheet, there are positive contributions to helping Africa to meet the challenges of access to energy and energy equity and increase the potential for strengthened human security. An OECD/IEA 2016 analysis concluded that "a substantial proportion of Chinese power projects in Sub-Saharan Africa are aimed at expanding access to electricity". The study also concludes that in the decade 2010-2020, a total of 120 million people will gain access to electricity through the power grid, enabled by grid development and increasing power generation capacity, of which Chinese contractors are responsible for 30%" China also contributes to rural 'off-grid solutions' with solar energy kits donated in countries.

5. Conclusions and Policy Implications

This study set out to address the question 'Are the BRICS countries contributing to Africa's aims to increase its clean energy, extend access to energy, and create 'green' economies through renewable energy?' The study traced the evolution of BRICS policies on sustainable development, climate mitigation, renewable energies and green growth and assessed the respective contributory capacity of the member economies and the NDB to African development. The paper noted and explained the variable contributory capacity of the BRICS members, identifying economic, technical and political constraints on Russia and Brazil and, partially, on South Africa and the strengths of India and China. For Russia, the relationship with Africa will focus primarily on nuclear power cooperation and a multilateral contribution through the NDB as the latter's membership gradually widens. For Brazil, domestic economic and political instability ad a change in leadership is impacting upon its bilateral capacity to maintain its development assistance and technical cooperation trajectory of the past decade. The paper found that the already significant bilateral and multilateral roles India and China play in extending access to energy and advancing RE sources are set to widen and grow. Whilst China's involvement attracts widespread attention, India's role, albeit smaller than China and attracting relatively less controversy, nevertheless is significant and growing and is distinct from that of China. In terms of BRICS, these two members can act as a fulcrum for the group in advancing and delivering green economic growth and energy policy. A particular interest of the paper is the potential contribution the BRICS can make to human security and development in Africa. In this regard, the study found that the investment and technical projects being undertaken have had a positive impact in extending access to electricity, increasing generating capacity, off-grid community energy support, and growing the share of RE in Africa's energy mix through bilateral and multilateralised investment and technical assistance. The BRICS contribution connects with the group's commitments to COP21, the SDG goals and targets, Africa's Agenda 2063 and wider South-South Cooperation. The BRICS 'spirit' shares the emphasis of approach to embedded in these global, inter-regional and regional compacts focused on horizontal cooperation, equity and partnership. Within this process, the BRICS can act as an important catalyst and facilitator to reinforce existing African initiatives for example, working with its African partners to strengthen existing and help develop new energy pools and to provide additional impetus for regional and sub-regional integration and helping to lower energy costs, increase household access and cut energy poverty. The BRICS have an important role to play in finding the requisite finance to support the complex range of policy interventions to meet Africa's energy gap and change the region's energy mix. The NDB's General Strategy 2017-2021 reflects the BRICS' approach to sustainable development investment: promoting multilateralised, inter-regional funding cooperation based on a new ethos and operating principles. At the BRICS Durban summit, the BRICS stressed the importance of establishing a new long-term funding model that promotes multi-country projects. Adopting such a model would aim to accelerate the pace of Africa's regional integration.

The study finds that BRICS states are an important emerging influence on African energy, green growth and transformation policies; contributing to enhanced human security. The BRICS group's approach to climate change mitigation, African sustainable development and green growth is developing steadily, albeit at variable speeds across the membership. In this respect, the process will benefit from the formulation of a specific BRICS policy and strategy for RE technology cooperation and transfer. This would build upon the existing policy dialogue within BRICS and with African states to provide a focal point for the setting of aims and objectives, implementation pathways and establishment of coordination and planning working groups. Such a policy initiative and strategy needs to reflect the multidimensional character of green growth and this can be coordinated effectively with the AfDB's Green Growth Framework. It is also important to ensure policy synchronisation across the established areas of BRICS-Africa agreement and to frame the 'sustainable infrastructure' initiatives of the NDB in implementing its new General Strategy and its inter-institutional coordination relationships with other multilateral development banks such as the AIIB and the AfDB A further policy consideration is the evolving themes of the IPCC's AR6. Of particular interest from a focus on BRICS are the recommendations made by the Experts Meeting to work towards climate change mitigation from sustainable development and to embed measures within the wider frame of multiple policy domains and sustainable development trajectories. A central policy challenge for the BRICS and for its African partners is one of focus. From a Human Security perspective, the key requirement is to ensure that the pro-poor aims of the multiple policy strands of climate mitigation, green growth, energy access and renewable energy are mainstreamed and prioritised. This means, in practice, a strengthened commitment to greater "bottom-up" local participation, community dialogue and cooperation in African societies, engaging not only at the level of governments to include community knowledge and interests. The role of individual BRICS members will continue to be the primary driving force for the short-to-medium term and their shared commitment to South-South Cooperation can provide the essential adhesive for closer technological cooperation on renewable energies, climate change mitigation and green economic growth.

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